PPM-91-551

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Interoffice Memorandum

To
T. Miccolis
Department
Code 300.1
From
K. Sahu KS
Department
7809
Subject
Radiation Report on UDS2983
SMEX Common Buy Part No. 5962-8851902VA

PPM-91-551
Date
September 27, 1991
Location
Lanham
Telephone
731-8954
Location
Lanham
cc
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A radiation evaluation was performed on UDS2983 to determine the total dose tolerance of these parts. A brief summary of the test results is provided below. For detailed information, refer to Tables I through IV and Figure 1.

The total dose testing was performed using a cobalt-60 gamma ray source. During the radiation testing, eight parts were irradiated under bias (see Figure 1 for bias configuration), and two parts were used as control samples. The total dose radiation steps were 25, 50, 75 and 100 krads. After 100 krads, parts were annealed at 25°C for 24 and 168 hours, and then irradiation was continued to 200 and 300 krads (cumulative). The dose rate was between 1.3 - 5.0 krads/hour, depending on the total dose level (see Table II for radiation schedule). After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits listed in Table III. These tests included a functional test after each radiation and annealing step.

All (8) parts passed all initial electrical measurements and all functional tests to 300 krads. However, after the first radiation exposure of 25 krads, all parts exceeded the 4V measurement limit of the test equipment for VSAT1. In addition, most outputs of all parts failed to meet the minimum specification limit of -200mA for IOUT. After 50 krads and above, all outputs of all parts had IOUT readings of approximately -1mA and VSAT1 continued to exceed 4V. Strangely, VSAT2 and VSAT3 failures were observed on four parts after 25 krads, but no VSAT2 or VSAT3 failures were observed at any other radiation step up to 300 krads.

Table IV provides the mean and standard deviation values for each parameter after different radiation exposures and annealing treatments. It also provides a summary of the functional test results after each radiation/annealing step.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at 301-731-8954.

TABLE I. Part Information

Generic Part Number:	UDS2983
SMEX Common Buy Part Number:	5962-8851902VA
SMEX Common Buy Control Number:	1691
Charge Number:	C90241
Manufacturer:	Sprague Electric Co.
Quantity Procured:	125
Lot Date Code:	9026A
Quantity Tested:	10
Serial Numbers of Radiation Samples:	3, 4, 5, 6, 7, 8, 9, 10
Serial Numbers of Control Samples:	1, 2
Part Function:	High-Current/High-Voltage Driver
Part Technology:	Bipolar
Package Style:	18-Pin DIP
Test Engineer:	C. Nguyen

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	03/20/91
2) 25 krads irradiation @ 1350 rads/hr	04/21/91
Post 25 krads Electrical Measurements	04/22/91
3) 50 krads irradiation @ 1390 rads/hr	04/22/91
Post 50 krads Electrical Measurements	04/23/91
4) 75 krads irradiation @ 1315 rads/hr	04/23/91
Post 75 krads Electrical Measurements	04/24/91
5) 100 krads irradiation @ 1390 rads/hr	04/24/91
Post 100 krads Electrical Measurements	04/25/91
6) 24 hrs annealing	04/25/91
Post 24 hr Electrical Measurements	04/26/91
7) 168 hrs annealing	04/25/91
Post 168 hr Electrical Measurements	05/02/91
8) 200 krads irradiation @ 5555 rads/hr	05/02/91
Post 200 krads Electrical Measurements	05/03/91
9) 300 krads irradiation @ 1515 rads/hr	05/03/91
Post 300 krads Electrical Measurements	05/06/91

Notes:

- All parts were radiated under bias at the cobalt-60 gamma ray facility at GSFC.
- All electrical measurements were performed off-site at 25°C.
- Annealing was performed at 25°C under bias.

Table III. Electrical Characteristics of UDS2983

Unless otherwise specificd:
T_A=25°C, +V_{CC}=80V, V_{IN}=2.4V

TEST	CONDITIONS	LIMIT		UNITS
		Min	Max	
I_{CC}	V_{IN}=2.4V	0	10.0	mA
I_{CEX}	V_{IN}=0.25V, V_{OUT}=0V	0	200	uA
I_R	V_{CC}=80V, V_{OUT}=80V , V_{in}=0.25V	0	50	uA
V_F	I_F=200mA, V_{IN}=V_{CC}=OPEN	0	1.75	V
V_{SAT1}	I_{OUT}=-350mA, V_{IN}=2.4V, V_{CC}=5V	0	2.0	V
V_{SAT2}	I_{OUT}=-200mA, V_{IN}=2.4V, V_{CC}=5V	0	1.9	V
V_{SAT3}	I_{OUT}=-100mA, V_{IN}=2.4V, V_{CC}=5V	0	1.8	V
I_{INL}	V_{CC}=80V, V_{IN}=0V	-10	10	uA
I_{INH1}	V_{CC}=80V, V_{IN}=2.4V	0	295	uA
I_{INH2}	V_{CC}=80V, V_{IN}=3.85V	0	600	uA
I_{INH3}	V_{CC}=80V, V_{IN}=12V	0	2.3	mA
I_{OUT}	V_{CE}=2.2V, V_{IN}=2.4V, V_{CC}=5V	-500	-200	mA
TP_{LH}	V_{CC}=35V, R_L= 175 OHM	0	2.0	uS
TP_{HL}	V_{CC}=35V, R_L= 175 OHM	0	10.0	uS

Note: Functional Test performed at 10KHz, Vcc=80V, V_{IH}=15V, V_{IL}=0V, V_{OH}=25V, V_{OL}=25V.

The TP_{LH} and TP_{HL} tests were preformed at V_{CC}=35V and R_L=175 OHM, due to the limitation of the tester.

TABLE IV: Summary Electrical Measurements after Total Dose Exposures and Annealing for UDS2983 1/, 2/

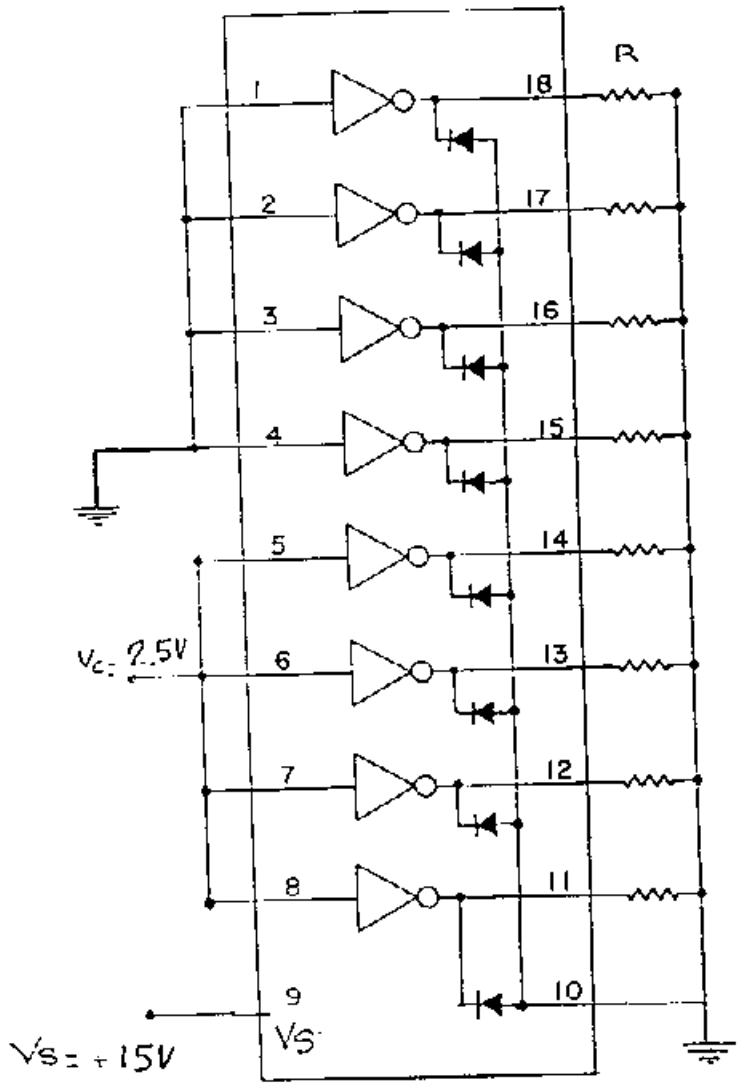
Parameters		Spec. Limits min	Spec. Limits max	Initials mean	Initials sd	Total Dose Exposure (krads) 25 mean	25 sd	50 mean	50 sd	75 mean	75 sd	100 mean	100 sd	Annealing 24 hrs mean	24 hrs sd	168 hrs mean	168 hrs sd	Total Dose (krads) 200 mean	200 sd	300 mean	300 sd
Functional				Pass		Pass		Pass		Pass		Pass		Pass		Pass		Pass		Pass	
ICC	mA	0	10	5.0	0.1	4.0	0.1	3.9	0.1	3.9	0.1	3.9	0.1	3.9	0.1	3.9	0.1	3.8	0.1	3.7	0.1
ICEX	uA	0	200	0	0	.01	.01	.01	.01	.03	.01	.04	.01	.03	.01	.01	0	.3	.1	0.1	0.1
IR	uA	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.02	.03
VF	V	0	1.75	1.1	.05	1.2	.05	1.2	.04	1.2	.04	1.2	0.1	1.2	0.1	1.3	0.1	1.3	0.1	1.3	0.1
VSAT1	V	0	2.0	1.83	.02	>4		>4		>4		>4		>4		>4		>4		>4	
VSAT2	V	0	1.9	1.64	.03	1.9	0.4	1.69	.03	1.68	.02	1.67	.02	1.70	.02	1.71	.03	1.68	.03	1.69	.02
VSAT3	V	0	1.8	1.50	.02	2.0	0.4	1.56	.01	1.54	.02	1.55	.02	1.56	.02	1.9	0.6	1.55	.03	1.56	.02
IIL	uA	-10	10	0	0	0	0	0	0	0	0	-.02	.01	0	0	0	0	.09	.04	-.05	.05
IIH1	uA	0	295	148	3	147	4	142	3	142	3	141	3	141	3	141	3	140	3	139	5
IIH2	uA	0	600	337	5	335	5	331	7	328	6	329	5	325	7	328	8	324	5	320	7
IIH3	mA	0	2.3	1.4	.08	1.4	.05	1.4	.04	1.4	.03	1.4	.04	1.4	.03	1.4	.04	1.4	.03	1.4	.03
IOUT	mA	-500	-200	-454	1	-180	70	-1.2	.2	-1.0	.2	-1.0	.2	-1.0	.2	-4.0	3.0	-1.0	.2	-1.0	0.2
TPLH	us	0	2	.31	.01	.36	.02	.38	.07	.40	.03	.40	.04	.41	.05	.40	.05	.48	.03	.40	.03
TPHL	us	0	10	4.9	0.2	1.7	0.2	1.4	0.1	1.0	0.1	1.1	0.1	1.1	0.1	1.3	0.1	0.9	0.1	0.9	0.1

Notes:

1/ The mean and standard deviation values were calculated over the eight parts irradiated in this testing. The control samples remained constant throughout the testing and are not included in this table.

2/ '>4' for VSAT1 in Table IV indicates that parts were exceeding the 4V upper limit that the test equipment could measure for this parameter.

Figure 1. Radiation Bias Circuit for UDS2983



ALL R = 1KΩ ± 5% ¼W